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BOOK REVIEWS

Die Praxis der Konstanzmethode. By F. M. URBAN. Leipzig, Wilhelm Engelmann, 1912. pp. 26.

Hilftabellen für die Konstanzmethode. By F. M. URBAN. *Arch. f. d. ges. Psychol.*, XXIV., 1912. 236-243.

The second paper contains certain tables and an explanation of their use for the solving of the calculations required for the evaluation of data taken by the method of constant stimuli. The first paper also contains this same material, along with other considerations, and we shall leave the discussion of them until later.

The first paper, as the name indicates, is a short description of the method of constant stimuli, or more properly, of the calculations connected with that method. This is really a brief summary of all of the former papers of the author dealing with this subject. Of all the psychophysical measurement methods, we have perhaps, the best understanding of the processes, as well as the theory, of the method of constant stimuli. There have been a great many attempts in the last few years to elucidate the hypothesis upon which this method is based and also to lessen the work of calculation as much as possible. With the method in its present form, the author hopes that it can be used for clinical purposes with as great ease and greater accuracy than any of the other psychophysical measurement methods that are used to-day.

In the method of constant stimuli, a judgment is considered as a chance event dependent upon the relation of the intensity of the standard and comparison stimuli and upon the psychophysical constitution of the subject. The experimental procedure of this method aims to ascertain with what relative frequency the different judgments occur upon our various comparison stimuli. These relative frequencies are viewed as probabilities with which the judgment will occur; and this leads directly to the notion of the psychometric functions, which give the probabilities of our judgments for all intensities of the comparison stimulus. The calculations are effected either by interpolation or by assuming an appropriate analytical expression. Such an assumption has the character of a hypothesis which must have two general requisites: it must fit the nature of the experimental procedure, and it must fit the facts of experience. The so-called $\Phi(\gamma)$ Hypothesis fits the facts and is the basis of the method of constant stimuli. The calculation of the thresholds and their co-efficients of precision is rather cumbersome, because it requires the solution of a system of equations by the method of least squares.

Urban has found that, by adopting a scheme proposed by Wirth (*Psychophysik*, 1912, p. 213) this work can be reduced considerably by employing tables which require only the space of two pages. These are the tables spoken of as appearing in both papers, along with the directions for their use. These tables are sufficiently extended to enable one to calculate the constants h and c for a comparison series of fifteen stimuli. In using them, one merely looks up the values of the products for the observed relative frequencies of the different comparison stimuli; these products are then added, giving directly the

sums necessary for the setting up of the normal equations, which are then solved directly. The only check on the correctness of our calculations that is necessary is the assurance that we have copied our numbers accurately. The author shows that these tables may be applied only in cases where the number of judgments on our comparison stimuli are 25, 50, 100 or multiples of these, as the probabilities are calculated only to two decimal places. He also goes into a consideration of the accuracy of the final determination of the constants h and c , in view of the number of decimal places retained in our products.

The value of these tables can not be overestimated, as the experimental procedure of the method of constant stimuli has been so standardized that, it seems to the reviewer, with a little care and foresight, no case should occur where the tables cannot be applied to the results. An entire calculation for a series of seven comparison stimuli with the help of these tables will require only about 15 to 20 minutes; and with practice even this time may be shortened. Indeed, the reviewer has seen an entire calculation for such a series completed in less than 10 minutes. Such a calculation can not be effected in less than an hour with the help of an adding machine or any of the large multiplication tables; and even more time than this is required when using logarithms for obtaining these products. Furthermore, the chance of committing errors of calculation is very much reduced by the use of these tables. Thus, with their publication, it seems to the writer that the method of constant stimuli has become the most practical of any of the psychophysical measurement methods. With this method alone, the subject has no knowledge of the objective relation of the stimuli, which knowledge may cause an error of expectation. The theory underlying this method is probably better known than that for any of the others. The one argument against the use of the method of constant stimuli has been that the calculations required were lengthy and cumbersome; now, with the publication of these tables, this final difficulty has been removed.

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The Consciousness of the Universal. By FRANCIS AVELING. London, Macmillan and Co., 1912. pp. x, 255.

Aveling has made a descriptive experimental study of the presence in consciousness of the universal idea. Such questions as the growth of meaning, the nature of abstraction, the existence of a thought element in meaning, and the relation of imagery to thought are examined; explanatory hypotheses and suggestions are added; and the book includes an historical sketch of seventy-two pages.

The experimentation was divided into two parts. In the first, Aveling attempted to arrange conditions under which meanings should be formed and become associated with nonsense words. The method consisted essentially in the systematic presentation to trained observers of ten sets of small pictures, with ten corresponding nonsense words,—the pictures representing familiar objects, such as carpenters' tools, musical instruments, etc., and each set being sufficiently homogeneous to justify its being grouped under one name. The words were then presented alone, and introspections obtained on the appearance in consciousness of the meaning which the word had acquired from its association with the pictures. The results were as follows: 1. Four stages were distinguished in the growth of meaning, ranging from an initial stage in which the words had not yet acquired meaning, but